

REMARKS

Upon entry of this Amendment, claims 1-9, 14-17 and 22-25 and 28-33 will be all the claims pending in the application. Claims 1-4, 6 and 7 have been amended and claims 10-13, 18-21, 26 and 27 have been canceled. Claim 1 was amended to incorporate therein the recitation of claim 10, claim 2 was amended to incorporate therein the recitation of claims 1 and 3, claim 3 was amended to incorporate therein the recitation of claims 4 and 10, claim 4 was amended to incorporate therein the recitation of claim 10, claim 6 was amended to incorporate therein the recitation of claims 4 and 10, and claim 7 was amended to incorporate therein the reciting claim 10. Further support for the amendments can be found, for example, at page 22, lines 6-12 and page 16, line 15 to page 17, line 24 of the present specification.

Entry of the above amendments is respectfully requested.

In addition, the Examiner is respectfully requested to acknowledge Applicants' claim to domestic to the provisional Application No. 60/121,436.

Review and reconsideration on the merits is requested.

Claims 1-33 were rejected under 35 U.S.C. § 102(e) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Hase et al.

Applicants respectfully traverse as follows.

As amended, claim 1 is directed to a carbon material for a lithium battery comprising graphite powder having an oxidation initiation temperature of not less than 600°C, a specific surface area of not more than 3 m²/g, an aspect ratio of not more than 6, and a tapping bulk density of not less than 0.8 g/cm³. Furthermore, the

graphite powder contains substantially no particles having a particle size of 3 μm or less and 53 μm or more.

As recited in canceled claim 2, when the powder is put under pressure to give said powder a bulk density of 1.5 g/cm³, the specific electrical resistance of said powder along a direction perpendicular to the direction of the pressure is not more than 0.06 Ωcm .

The Examiner considered that the properties of the graphite powder of Hase et al., such as aspect ratio and particle size, are controlled prior to graphitization.

However, according to Example 1 in Hase et al., "the mesophase pitch was ground in a jet mill, thereby obtaining fine powder which had an aspect ratio not greater than 2, was free of particles of 48 μm or greater in particle size, containing fine particles of 2 μm and smaller in particle size in a proportion not greater than 3 wt. % and had an average particle size of 16 μm " (col. 7, lines 45 to 50). From this description, it is clear that the graphite powder of Hase et al. does contain fine particles of 2 μm or less in particle size. This is reasonably understood since the step for removal of fine particles, such as clarification, was not conducted in Example 1 in Hase et al.

In contrast, in the present invention, the graphite powder contains substantially no particles having a particle size of 3 μm or less and 53 μm or more. As described at page 23, lines 4-7 of the specification, "It is preferred to pulverize the coke and the like before graphitization, classify the particles into predetermined particle sizes and specific surface areas, and then graphitize the particles."

In addition, at page 24, line 21 to page 25, line 6, the present specification

discloses that:

The coke and the like are pulverized by means of such a pulverizer and at this time, the average particle size is preferably adjusted to from 8 to 30 μm by selecting the pulverization conditions and if desired, classifying the powder. More preferably, particles having a particle size of 3 μm or less and/or particles having a particle size of 53 μm or more are substantially removed to reduce the amount of the particles having these particle sizes to 5% by weight or less of each, preferably 1% by weight or less. When particles having a particle size of 3 μm or less and particles having a particle size of 53 μm or more are removed, the resulting particles have an average particle size of from 10 to 25 μm .

Further, the present specification discloses at page 8, line 24 to page 9, line 4, that:

The bulk density of the powder is increased because there is a reduction in the amount of scaly particles or removal of fine particles having a size of 5 μm or less. When the bulk density is increased, more graphite particles are included per unit volume, and therefore, the intercalation rate of lithium may be increased.

The Examiner's attention is also directed to Examples 1-7 of the present application, in which particles having a particle size of 3 μm or less and particles having a particle size of 53 μm or more are substantially removed (Table 1).

In addition, Hase et al. does not disclose a graphite powder having a bulk density of 1.5 g/cm³ and a specific electrical resistance along a direction perpendicular to the direction of the pressure of not more than 0.06 Ωcm .

The importance of the bulk density and specific electrical resistance are discussed in the present specification. At page 9, line 19-26, the present specification discloses that:

Another important aspect of the present invention is that the addition of B improves the antioxidation properties, reduces the electric resistance of the powder, and remarkably improves the conductivity. Further, the improvement in resistance to oxidation decreases the activity of the surface of the particles, and the improvement in conductivity increases the intercalation capacity.

In addition, at page 16, line 15-24, the present specification discloses that:

A third aspect of the present invention is a carbon material for a lithium battery, which has the specific electric resistance, specific surface area, and tapping bulk density as specified above. When the graphite powder has high specific electric resistance, namely, a low conductivity, it causes not only a decrease in the discharge capacity and Coulombic efficiency, but also an increase in heat generation. The specific electric resistance in the third invention is 0.06 Ωcm or less, which is measured according to the following method shown in Fig. 2.

Further, at page 17, line 25 to page 18, line 16, the present specification discloses that:

In order to increase the conductivity of the graphite powder, the conductivity of the graphite itself must be increased, and therefore, an improvement in the crystallinity is necessary. For this purpose, it is effective to use the graphite produced from an easily-graphitizable material, or to increase the graphitizing temperature, for example. In addition, it is effective to improve the crystallinity of the graphite by using a graphitizing catalyst such as boron (B). It is also effective to decrease the number of contact points between the particles of the graphite, that is, to decrease the content of fine powder. In view of the conductivity, the particles of the graphite are preferably large. However, since there is a limit regarding the thickness of graphite powdery layer to be applied for an electrode of a battery, it is not possible to use graphite powder having very large particles. Therefore, the average particle size of the graphite is increased as much as possible provided that it does not cause problems in the electrode.

Hase et al. does not disclose or suggest the use of graphite produced from an easily-graphitizable material, to increase the graphitizing temperature to improve the crystallinity of the graphite by using a graphitizing catalyst, such as boron (B), or to decrease the number of contact points between the particles of the graphite, that is, to decrease the content of fine powder, in order to improve conductivity of graphite powder.

Therefore, the present invention is neither anticipated by nor obvious over Hase et al., and withdrawal of the foregoing rejection is respectfully requested.

In conclusion, the §102/103(a) rejection should be overcome, and in view of the above, it is respectfully submitted that the claims are in condition for allowance.

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. Application No. 09/807,075

Attorney Docket Q53366

Reconsideration and withdrawal of the rejection is respectfully requested, and allowance of claims 1-9, 14-17, 22-25 and 28-33 at an early date is respectfully requested.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Respectfully submitted,

Keiko K. Takagi / by [signature]
Reg. No. 33,276

Keiko K. Takagi
Registration No. 47,121

Date: September 29, 2003